First Report of the Genus *Proadusta* Sacco, 1894 (Gastropoda: Cypraeidae) from the Western Hemisphere, with a Description of a New Species from the Eocene of Washington

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ABSTRACT

A new species of cypraeid gastropod, *Proadusta goedertorum* n. sp., is reported from the middle lower Eocene ("Capay Stage") upper part of the Crescent Formation, Thurston County, Washington. This new species was found at two localities where shallow-water marine deposits are interbedded with rocky shoreline-forming basalt flows. *Proadusta* Sacco, 1894 was previously known only from the lower Eocene to lower Miocene of Europe, Myanmar (= Burma), and Indonesia.

Key words: Proadusta, Cypraeidae, Western Hemisphere, Eocene, Washington.

INTRODUCTION

Only five species of the family Cypraeidae are known from the Eocene of the eastern Pacific region (Groves, 1993; 1994a), and *Nucleolaria cowlitziana* Groves, 1994a is previously the only true cypraeid known from the Eocene of Washington. The first appearance of the genus *Proadusta* Sacco, 1894 in the Western Hemisphere is recorded here with the description of *Proadusta goedertorum* Groves and Squires, n. sp. from middle lower Eocene ("Capay Stage") strata in the upper part of the Crescent Formation, Thurston County, Washington. *Proadusta goedertorum* is also one of only two species of the genus found anywhere in the lower Eocene, the other being *P. chevallieri* (Cossmann, 1896) from Ypresian deposits of Lianeourt, Oise Department, France.

STRATIGRAPHY

The new species is from the upper part of the Crescent Formation of Arnold (1906) at CSUN localities 1563 and 1564 (= LACMIP localities 16655 and 16848) at Larch Mountain, just west of Olympia, in the Black Hills area in the Washington Coast Ranges (Figure 1). These localities have been the subject of recent studies by Squires and Goedert (1994; in press) involving molluscan paleontology, depositional environment, and geologic age.

Fossil-bearing rocks at both localities consist of a thin section of richly fossiliferous and conglomeratic silty mudstone interbedded with basalt. Extrusion of the basalt caused shoaling and the establishment of a rocky shoreline community where gastropod and bivalved mollusks lived with colonial corals and abundant coralline algae. Shells were transported a short distance seaward where they were deposited as a matrix of coquina that infilled spaces between basalt boulders. Many of the shells in the coquina are small to minute, and their size prevented them from being destroyed during transport. Within the coquina are a few larger shells, like those of the new species, that apparently lived in the shallow-subtidal environment where coquina accumulation took place (Squires & Goedert, 1994; in press).

GEOLOGIC AGE

Based on mollusks and benthic foraminifera, Squires and Goedert (1994; in press) assigned the rocks at both CSUN localities 1563 and 1564 to the middle lower Eocene ("Capay Stage"). Clark and Vokes (1936) were the first to recognize this west coast mega-invertebrate stage. The stage name is informal; therefore, it is placed in quotation marks. Givens (1974) modified the use of the "Capay Stage," and it is in this modified sense that the name is used herein. As discussed in Squires et al. (1992), this stage is equivalent to the west coast benthic foraminiferal Penutian Stage, as used in the emended sense of Almgren et al. (1988). The "Capay Stage" is also equivalent to the middle part of the European Ypresian Stage (Squires, 1987).

ABBREVIATIONS

Abbreviations used for catalog numbers and/or locality numbers are: CSUN, California State University, Northridge; LACM, Natural History Museum of Los Angeles County, Malacology Section; LACMIP, Natural History Museum of Los Angeles County, Invertebrate Paleon-

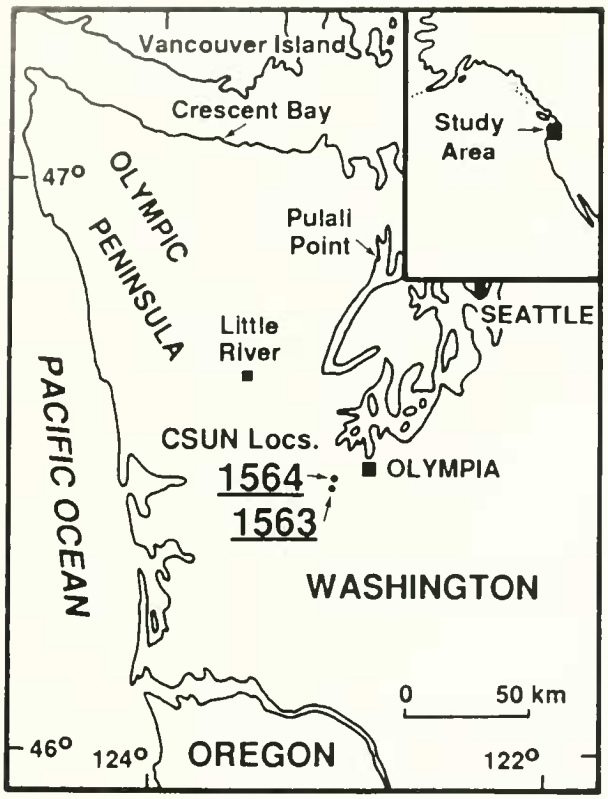


Figure 1. Index map showing localities of the new species described herein (Type locality = CSUN 1563 [= LACMIP 16655]). Localities are described in the "Localities Cited" section.

tology Section. Measurement parameters are defined as follows: length = greatest distance between anterior and posterior ends; width = greatest distance between lateral margins; and height = greatest distance between base and dorsum.

The classification herein follows that of Schilder and Schilder (1971).

SYSTEMATIC PALEONTOLOGY

Superfamily Cypraeacea Rafinesque, 1815
Family Cypraeidae Rafinesque, 1815
Subfamily Erosariinae Schilder, 1924
Tribe Pustulariini Schilder, 1932
Genus *Proadusta* Sacco, 1894

Type Species: *Cypraea (Proadusta) denticulina* Sacco, 1894 [= *C. (P.) splendens* (Grateloup, 1845) var. *denticulina* Sacco, 1894 (not of Grateloup)] by subsequent designation of Cossmann (1903:156). Lower Oligocene (Lattorfian Stage), Carcare, Liguria Province, northwestern Italy [Note: The Lattorfian Stage of Mayer-Eymar (1893) has been rejected as a standard chronostratigraphic unit of the lowermost Oligocene and may span the interval from the late Middle Eocene to the earliest Oligocene [= Priabonian through earliest Rupelian] (Berggren et al., 1985; Prothero, 1994)].

Original Description: *Testa affinis* Adusta, *sed spira non excavata, plus minusve prominens* (Sacco, 1894:33).

Diagnosis: Shell small to medium in size (19 mm), ovate to pyriform, with produced extremities; aperture curved posteriorly, with narrow deep canals; teeth numerous and fine; fossula wide, shallow, smooth (modified from Wenz, 1941).

Remarks: Schilder and Schilder (1971) recognized at least 18 species and 10 subspecies of *Proadusta* from lower Eocene (Ypresian) through lower Miocene (Aquitanian) strata of Europe and southeast Asia. (Specific ranges include: EOCENE of Belgium, England, France, Germany, Indonesia (Borneo), and Italy; OLIGOCENE of France, Germany, Italy, and Myanmar (= Burma); and MIOCENE of France). *Proadusta goedertorum*, sp. nov. is the first report of this extinct genus in the Western Hemisphere.

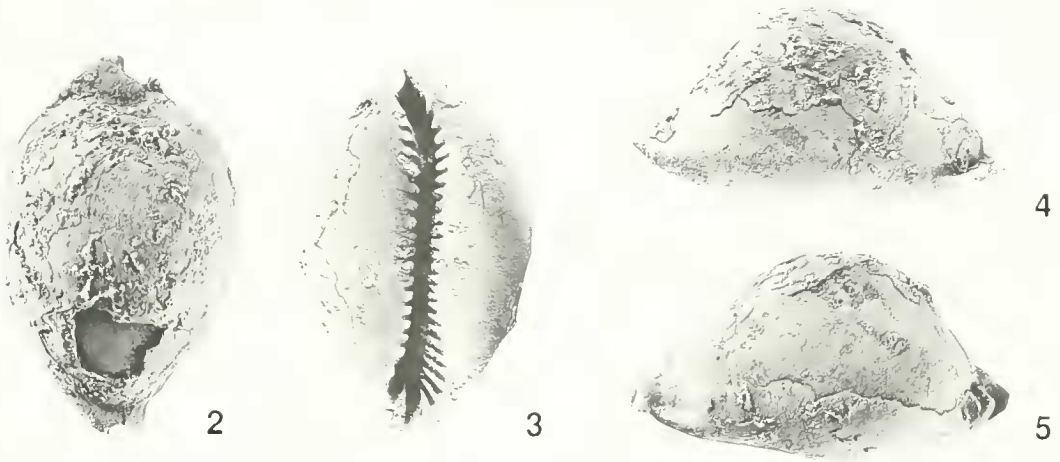
Dolin (1991) described *Cypraeacites blowi* from the upper Eocene (lowermost Jacksonian), Moodys Branch Formation, Montgomery Landing (= Creole Bluff), Grant Parish, Louisiana [U.S. Geological Survey locality 2003]. Groves (1994b) assigned *C. blowi* to the genus *Proadusta* following Schilder (1939) and Schilder and Schilder (1971) who had placed *Cypraeacites* in synonymy with *Proadusta*. Under Article 20 of the ICZN (1985) the genus *Cypraeacites* is not an available name and *blowi* is here assigned to the new world genus *Cypraeorbis* of Conrad (1865) based on similarities of shell shape, terminal ridges, fossula, and dentition, therefore establishing *P. goedertorum* as the first record of the genus *Proadusta* in the Western Hemisphere.

The new species of *Proadusta* described herein from the middle early Eocene of Thurston County, Washington provides additional evidence that tropical conditions existed in this region. Durham (1950) reported that the tropics extended northward of 49°N along the Pacific coast of North America during most of the Eocene. Squires and Groves (1993) also documented an Eocene tropical climate in King County, Washington by the presence of the ovulid species *Sulcocypraea mathewsonii* (Gabb, 1869) from the Tukwila Formation. Groves (1994a) further documented tropical conditions in the Washington Eocene with the description of *Nucleolaria cowlitziana* from the Cowlitz Formation.

Proadusta goedertorum Groves and Squires, new species
(Figures 2-5)

Diagnosis: A *Proadusta* of small to medium size with produced extremities, posteriorly curved aperture, fine teeth, and smooth, wide fossula.

Description: Shell ovate shaped, small to medium in size with prominent produced extremities; spire covered; dorsum highly arched and smooth; maximum height slightly posterior of midpoint; slight marginal callus; base convex; aperture curved posteriorly toward columella; labial lip with 26 strong teeth with smooth interstices; columellar lip with 17 weak teeth with smooth interstices; teeth



Figures 2-5. *Proadusta goedertorum* Groves & Squires, n. sp., holotype. **2.** Abapertural view. **3.** Apertural view. **4.** Left-lateral view. **5.** Right-lateral view [all × 2.57].

produced at both extremities forming slight anterior marginal ridges, indistinct in posterior canal; fossula wide, smooth, concave; posterior and anterior terminal canals shallow and narrow; columellar lip slightly inflated; shallow pit above posterior terminus at base of dorsum.

Type Material: Holotype LACMIP 12375, paratype LACMIP 12376. The holotype measures 19.4 mm in length, 12.3 mm in width, and 10.8 mm in height. The paratype measures 17.1 mm in length, 10.4 mm in width, and 8.9 mm in height. Both specimens display original shell material. A third poorly preserved specimen from CSUN locality 1564 (= LACMIP locality 16848) also displays original shell material.

Type Locality: CSUN locality 1563 (= LACMIP locality 16655), Larch Mountain area, Black Hills, Thurston County, Washington (47°59′09N″, 123°8′12″W). Middle early Eocene age ("Capay Stage"), upper part of the Crescent Formation.

Comparison: The new species is most similar to *Proadusta moloni* (Bayan, 1870) from the middle Eocene (Lutetian Stage) of San Giovanni Ilarione, Veneto District, Italy. *Proadusta goedertorum* has more numerous, finer apertural teeth and less pronounced terminal extensions. The new species also resembles *P. acyensis* (Raincourt, 1876) from upper Eocene (Auversian Stage) of Acy, Oise Department, France but has a less sinuous aperture, narrower posterior and anterior canals, and a wider labial margin.

Discussion: The excellent preservation of the new species allows for its unequivocal generic assignment. *Proadusta goedertorum* is significantly different from all other eastern Pacific cypraeids and is the only representative of this genus in the Western Hemisphere.

Etymology: This new species is named after James L. and Gail H. Goedert, Gig Harbor, Washington, for their numerous valuable contributions to the study of invertebrate and vertebrate paleontology of Washington.

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